

WHAT IS CLAIMED IS:

1. A communication system comprising a communication apparatus connected to a voice terminal apparatus and an opposite-side communication apparatus connected to an opposite-side voice terminal apparatus, and making said communication apparatus and said opposite-side communication apparatus communicate with each other through a communication channel, wherein:

said communication apparatus comprises;

a voice coding unit for code-compressing a voice signal from said voice terminal apparatus and thereby generating voice information,

a DTMF detecting unit for detecting a DTMF signal from a voice signal from said voice terminal apparatus,

a DTMF coding unit for, when this DTMF detecting unit has detected a DTMF signal, generating DTMF information by coding a DTMF signal into a specified form, and

an information outputting unit for outputting voice information generated by said voice coding unit and/or DTMF information generated by said DTMF coding unit to said communication channel.

2. A communication system according to claim 1, wherein:

said opposite-side communication apparatus comprises;

an opposite-side voice decoding unit for, when it has received voice information from said communication apparatus through said communication channel, decoding said voice information and thereby generating a voice signal,

an opposite-side DTMF information detecting unit for detecting that it has received DTMF information from said communication apparatus through said communication channel,

an opposite-side DTMF decoding unit for, when this opposite-side DTMF information detecting unit has detected DTMF information, decoding this DTMF

information and thereby generating the content of DTMF,

an opposite-side DTMF signal generating unit for generating a DTMF signal on the basis of the content of DTMF generated by this opposite-side DTMF decoding unit, and

an opposite-side voice outputting unit for making said opposite-side voice terminal apparatus voice-output a voice signal generated by said opposite-side voice decoding unit and/or a DTMF signal generated by said opposite-side DTMF signal generating unit.

3. A communication system according to claim 1, wherein:

said DTMF detecting unit has a DTMF signal monitoring unit for monitoring that said DTMF signal has been detected continuously for a predetermined time or longer and, when this DTMF signal monitoring unit has continuously detected said DTMF signal, judges that it has detected said DTMF signal from said voice signal.

4. A communication system according to claim 1, wherein:

said communication apparatus comprises an ATM cell generating unit for converting voice information generated by said voice coding unit or DTMF information generated by said DTMF coding unit into an ATM cell in an ATM cell form, and

said information outputting unit outputs said voice information and/or said DTMF information converted into a cell by said ATM cell generating unit to said communication channel in an ATM cell form.

5. A communication system according to claim 4, wherein:

said opposite-side communication apparatus comprises an opposite-side ATM cell decomposing (de-celling) unit for, when it has detected voice information or

DTMF information from said communication apparatus in said ATM cell form through said communication channel, cell-decomposing (de-celling) the voice information or DTMF information from said communication apparatus, said information being converted into a cell in this ATM cell form.

6. A communication system according to claim 1, wherein:

said DTMF information has a header portion indicating destination information and a payload portion containing DTMF code information indicating the code of said DTMF signal and signal detecting time information indicating the time of detecting this DTMF signal.

7. A communication system according to claim 6, wherein:

said DTMF detecting unit has a measuring unit for measuring the signal detecting time of said DTMF signal and an analyzing unit for analyzing the code of said DTMF signal, and

said DTMF coding unit, when said DTMF signal has been detected continuously for a predetermined time or longer, generates said signal detecting time information on the basis of the result of measurement of said measuring unit, generates said DTMF code information on the basis of the result of analysis of said analyzing unit, and generates said DTMF information including these signal detecting time information and DTM code information.

8. A communication system according to claim 2, wherein:

said DTMF information has a header portion indicating destination information and a payload portion containing DTMF code information indicating the code of said DTMF signal and signal detecting time information indicating the time of detecting this DTMF signal.

9. A communication system according to claim 8, wherein:

said opposite-side DTMF decoding unit decodes said DTMF information and thereby generates the content of DTMF containing said DTMF code information and signal detecting time information, and

said opposite-side DTMF signal generating unit generates said DTMF signal on the basis of DTMF code information and signal detecting time information of the content of DTMF generated by said opposite-side DTMF decoding unit.

10. A communication system in which a communication apparatus and an opposite-side communication apparatus are connected to each other through a communication channel, wherein:

said communication apparatus comprises;

a voice coding unit for code-compressing a voice signal received from a terminal apparatus and thereby generating voice information,

a DTMF detecting unit for detecting that a voice signal received from said terminal apparatus is a DTMF signal,

a DTMF coding unit for, when this DTMF detecting unit has detected the DTMF signal, coding a DTMF signal into a specified form and thereby generating DTMF information, and

an information outputting unit for outputting voice information generated by said voice coding unit and/or DTMF information generated by said DTMF coding unit to said communication channel; and

said opposite-side communication apparatus comprises;

a voice decoding unit for, when voice information from said communication apparatus has been received through said communication channel, decoding this voice information and thereby generating a voice signal,

a DTMF information detecting unit for detecting DTMF information from said

communication apparatus through said communication channel,

a DTMF decoding unit for, when this DTMF information detecting unit has detected DTMF information, decoding this DTMF information and thereby generating the content of DTMF,

a DTMF signal generating unit for generating said DTMF signal on the basis of the content of DTMF generated by this DTMF decoding unit, and

a voice outputting unit for voice-outputting a voice signal generated by said voice decoding unit or a DTMF signal generated by said DTMF signal generating unit to an opposite-side terminal apparatus.

11. A communication system according to claim 10, wherein:

said DTMF detecting unit has a DTMF signal monitoring unit for monitoring whether or not it has detected said DTMF signal continuously for a predetermined time or longer and, when this DTMF signal monitoring unit judges that it has continuously detected said DTMF signal, judges that it has detected said DTMF signal from said terminal apparatus.

12. A communication system according to claim 10, wherein:

said communication apparatus comprises an opposite-side ATM cell generating unit for converting voice information generated by said voice coding unit or DTMF information generated by said opposite-side DTMF coding unit into an ATM cell in an ATM cell form, and

said information outputting unit outputs said voice information and/or said DTMF information converted into a cell by said ATM cell generating unit to said communication channel in an ATM cell form.

13. A communication system according to claim 12, wherein:

said opposite-side communication apparatus comprises an ATM cell decomposing (de-celling) unit for, when it has detected voice information or DTMF

information from said communication apparatus in said ATM cell form through said communication channel, cell-decomposing (de-celling) the voice information or DTMF information from said communication apparatus converted into a cell in this ATM cell form.

14. A communication system according to claim 10, wherein:

said DTMF information has a header portion indicating destination information and a payload portion containing DTMF code information indicating the code of said DTMF signal and signal detecting time information indicating the signal detecting time of this DTMF signal.

15. A communication system according to claim 14, wherein:

said DTMF detecting unit has a measuring unit for measuring the signal detecting time of said DTMF signal from said terminal apparatus and an analyzing unit for analyzing the code of said DTMF signal, and

said DTMF coding unit, when said DTMF signal from said terminal apparatus has been detected continuously for a predetermined time or longer, generates said signal detecting time information on the basis of the result of measurement of said measuring unit, generates said DTMF code information on the basis of the result of analysis of said analyzing unit, and generates said DTMF information including these signal detecting time information and DTM code information.

16. A communication system according to claim 14, wherein:

said DTMF decoding unit decodes said DTMF information and thereby generates the content of DTMF containing said DTMF code information and signal detecting time information, and

said DTMF signal generating unit generates said DTMF signal on the basis of

DTMF code information and signal detecting time information of the content of DTMF generated by said DTMF decoding unit.

17. A communication method of a communication system comprising a communication apparatus connected to a terminal apparatus and an opposite-side communication apparatus connected to an opposite-side terminal apparatus, and making said communication apparatus and said opposite-side communication apparatus communicate with each other through a communication channel, said method comprising the steps of:

code-compressing a voice signal received from said terminal apparatus and thereby generating voice information,

detecting that a voice signal received from said terminal apparatus is a DTMF signal,

coding this DTMF signal in a specified form when this DTMF signal has been detected and thereby generating DTMF information, and

outputting said voice information and/or said DTMF information to said communication channel.

18. A communication method according to claim 17, further comprising the steps of:

decoding voice information when said voice information has been received from said communication apparatus through said communication channel and thereby generating a voice signal,

detecting that DTMF information has been received from said communication apparatus through said communication channel,

decoding this DTMF information when this DTMF information has been detected and thereby generating the content of DTMF,

generating said DTMF signal on the basis of the content of DTMF generated,
and

making said opposite-side terminal apparatus voice-output said voice signal
and/or said DTMF signal decoded.

19. A communication method according to claim 18, performing in order the steps
of:

code-compressing a voice signal received from said opposite-side terminal
apparatus and thereby generating voice information,

detecting that a voice signal received from said opposite-side terminal
apparatus is a DTMF signal,

coding this DTMF signal into a specified form when this DTMF signal has
been detected and thereby generating DTMF information, and

outputting said coded DTMF information and/or voice information to said
communication channel; and

performing in order the steps of:

decoding voice information when this voice information has been received from
said opposite-side communication apparatus through said communication channel
and thereby generating a voice signal,

detecting that voice information received from said opposite-side
communication apparatus through said communication channel is DTMF
information,

decoding this DTMF information when this DTMF information has been
detected and thereby generating the content of DTMF,

generating said DTMF signal on the basis of the content of DTMF generated,
and

voice-outputting a decoded voice signal and/or DTMF signal or said voice

signal to said terminal apparatus.

20. A communication system comprising a communication apparatus connected to a voice terminal apparatus and an opposite-side communication apparatus connected to an opposite-side voice terminal apparatus, and making said communication apparatus and said opposite-side communication apparatus communicate with each other through a communication channel, wherein:

said communication apparatus comprises;

a voice code compressing portion for voice-code-compressing a voice signal from said voice terminal apparatus,

a voice cell generating portion for generating a voice cell by converting a voice signal voice-code-compressed by this voice code compressing portion into a cell,

a DTMF signal detecting portion for detecting whether or not a DTMF signal is contained in a voice signal from said voice terminal apparatus and outputting this content of detection as a first DTMF detection signal,

a DTMF signal monitoring portion for, when the first DTMF detection signal from this DTMF signal detecting portion has been detected, generating signal detecting time information and code information of a DTMF signal and outputting the content of DTMF including these signal detecting time information and DTMF code information as a second DTMF detecting signal,

a DTMF cell generating portion for generating a DTMF cell by generating DTMF information on the basis of the first DTMF detection signal from said DTMF signal detecting portion and the second DTMF detection signal from said DTMF signal monitoring portion and converting this DTMF information into a cell, and

a cell multiplexing portion for outputting said voice cell or said DTMF cell to said communication channel.